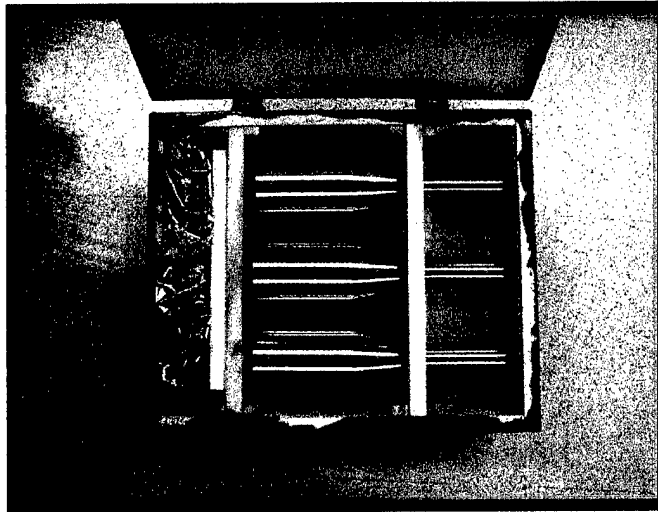


**FINAL REPORT
JANUARY 2002**

REPORT NO. 02-07



**82MM HE CARTRIDGE, HE, MODEL 30, WITH PD FUZE,
MODEL MP-1B, 3 PER BOX
UNITED NATIONS (UN) PERFORMANCE ORIENTED
PACKAGING (POP) TEST**

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Prepared for:

U.S. Army Armament Research, Development
and Engineering Center
ATTN: AMSTA-AR-WEP-RP
Rock Island, IL 61299-7300

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**VALIDATION ENGINEERING DIVISION
MCALESTER, OKLAHOMA 74501-9053**

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82MM HE CARTRIDGE, MODEL 30,
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JANUARY 2002

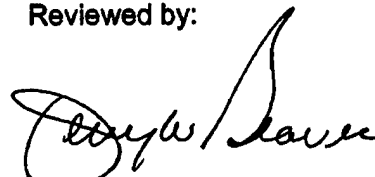
ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SOSAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct a UN POP Test for the 82mm HE Cartridge, Model 30, with PD Fuze, Model MP-1B, 3 Per Box. Six boxes were used in the tests. No significant flaws were found. As a result of the performance during testing, the box for three (3) 82mm HE cartridges, Model 30, with PD Fuze, Model MP-1B, is recommended for USA-wide use.

Prepared by:


JEFFERY L. DUGAN
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Reviewed by:


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U.S. ARMY DEFENSE AMMUNITION CENTER

VALIDATION ENGINEERING DIVISION
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REPORT NO. 02-07

82MM HE CARTRIDGE, MODEL 30,
WITH PD FUZE, MODEL MP-1B, 3 PER BOX,
UNITED NATIONS (UN) PERFORMANCE ORIENTED
PACKAGING (POP) TEST

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PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SOSAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct a UN POP Test on the box for three (3)m82mm HE Cartridge, Model 30, with PD Fuze, Model MP-1B.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Operations Support Command (OSC), Rock Island, IL. Effective 9 July 1993, the three-letter designator "DEV" was assigned for use when conducting UN POP tests. Effective 9 August 1994 this designation was included in the Joint Regulation AR 700-143, Performance Oriented Packaging of Hazardous Materials. Reference is made to the following:

IOC-R, 10-23, Mission and Major Functions of USADAC,
7 January 1998.

C. OBJECTIVE. To determine if this item meets UN POP requirements.

D. CONCLUSION. As tested, the box for three (3) 82mm HE cartridge, Model 30, with PD Fuze, Model MP-1B, meets all UN POP requirements with no problems encountered during testing.

PART 2 – ATTENDEES

DATE PERFORMED: DECEMBER 2001

ATTENDEE

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PART 3 -TEST PROCEDURES

The test procedures outlined herein were extracted and summarized from 49 CFR, Subpart M, Section 178.600. All tests were conducted to Packing Group II requirements.

A. DROP TEST. Each package will be dropped onto a non-yielding surface from the height and orientations listed below. The drop height is measured as the vertical distance from the target to the lowest point on the package. The drop height for Packing Group I is 1.8 meters (5.9 feet), for Packing Group II it is 1.2 meters (3.9 feet), and Packing Group III is 0.8 meters (2.6 feet). Materials which have a specific gravity (SG) exceeding 1.2, the drop height must be calculated as follows: for Packaging Group I the SG X 4.9 feet; for Packaging Group II the SG X 3.3 feet; and, for Packaging Group III the SG X 2.2 feet.

Packaging	No. of Tests	Drop Orientation of Samples
Steel drums, Aluminum drums, Metal Drums (other than steel or aluminum), Steel jerricans, Plywood drums, Wooden barrels, Fiber drums, Plastic drums and jerricans, Composite packagings which are in the shape of a drum	Six ... (three for each drop)	First drop (using three samples): The package must strike the target diagonally on the chime or, if the packaging has no chime, on the circumferential seam or an edge. Second drop (using the other three samples): The package must strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body.
Boxes of natural wood, Plywood boxes, Reconstituted wood boxes, Fiberboard boxes, Plastic boxes, Steel or aluminum boxes, Composite packagings which are in the shape of a box.	Five... (one for each drop)	First drop: Flat on the bottom (using the first sample). Second drop: Flat on the top (using the second sample). Third drop: Flat on the long side (using the third sample). Fourth drop: Flat on the short side (using the fourth sample). Fifth drop: On a corner (using the fifth sample).
Bags --- single-ply with a side seam	Three... (three drops per bag).	First drop: Flat on a wide face (using all three samples). Second drop: Flat on a narrow face (using all three samples). Third drop: On an end of the bag (using all three samples).
Bags --- single-ply without a side seam, or multi-ply	Three... (three drops per bag).	First drop: Flat on a wide face (using all three samples). Second drop: On an end of the bag (using all three samples).

B. STACKING TEST. Three test samples must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages that might be stacked on it during transport. The minimum height of the stack, including the test sample, must be 3.0 meters (10 feet). The duration of the test must be 24 hours, except that plastic drums, jerricans, and composite packaging 6HH, intended for liquids, shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40 degrees Celsius (104 degrees Fahrenheit). Alternative test methods that yield equivalent results may be used if approved by the Associate Administrator for Hazardous Materials Safety.

C. VIBRATION TEST. Three sample packagings, selected at random, must be filled and closed as for shipment. The three samples must be placed on a vibrating platform that has a vertical or rotary double-amplitude (peak-to-peak displacement) of one inch. The packages should be constrained horizontally to prevent them from falling off the platform, but must be left free to move vertically, bounce and rotate. The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material approximately 1.6mm (0.063 inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of any package and the platform.

D. PASS/FAIL CRITERIA. A package passes the above tests if there is no rupture or leakage from any of the samples. No test sample should show any deformation that could adversely affect transportation safety or any distortion liable to reduce packaging strength.

PART 4 – TEST RESULTS

UN POP tests for certification of the box for three (3) 82mm HE cartridge, Model 30, with PD Fuze, Model MP-1B, were performed. Six test samples were utilized during the tests. Applicable tests that were conducted were as follows:

A. DROP TEST. Drop tests were conducted on 20 December 2001 from 3.9 feet on test samples 1 and 2. The impact surface was a steel sheet covering a concrete surface that provided an unyielding surface. The drops conducted were oriented to hit on the top, bottom, long side, short side, and corner. Post drop inspections showed only minor board splitting and no significant damage. Photo 1 shows the setup used for the drop tests.

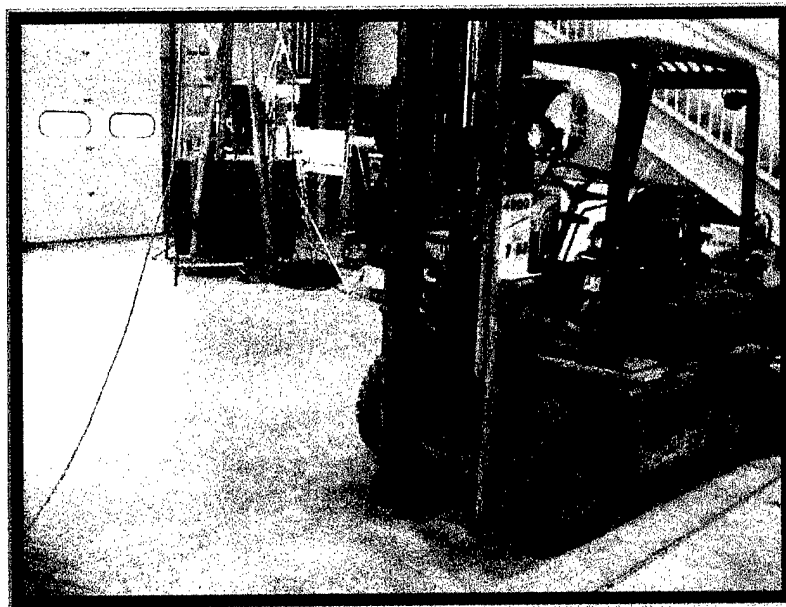


Photo 1. Drop Test Setup for UN POP Testing

B. STACKING TEST. The stacking test was conducted on 18-19 December 2001 for 24 hours on Test Samples 4, 5, and 6. The compression weight was 625 pounds. This weight equates to a minimum stack height of 10 feet as required by UN POP test procedures. The end of test inspection indicated no damage. See Photo 2 for the setup during the stacking test.

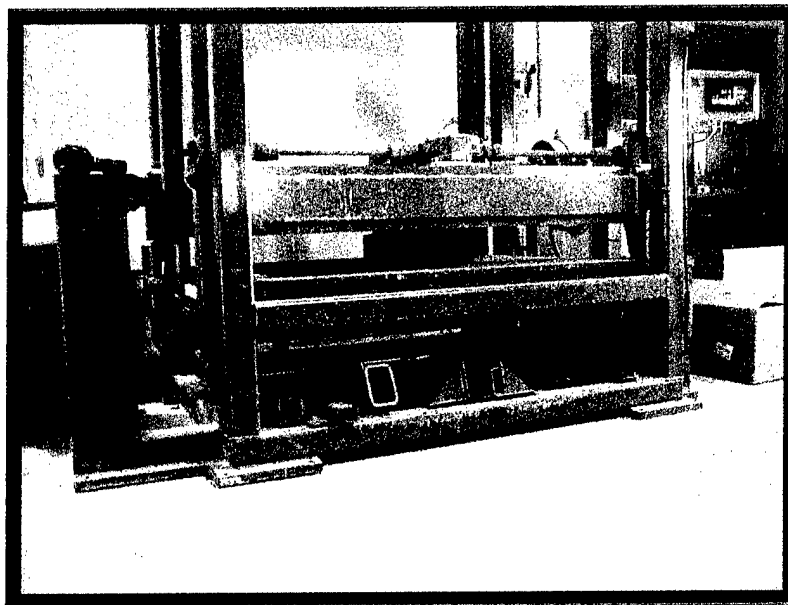


Photo 2. Stacking Test Setup for UN POP Testing

C. VIBRATION TEST - The vibration test was conducted on 20 December 2001 on Test Samples 1, 2, and 3. Each test sample was tested in the lateral and longitudinal position. The test ran for 1 hour for each test sample and each test sample ran at 221 cycles-per-minute in the lateral position and 221 cycles-per-minute in the longitudinal position. Following the completion of the test,

inspections revealed no damage to the containers. Photo 3 shows the setup for the vibration tests.

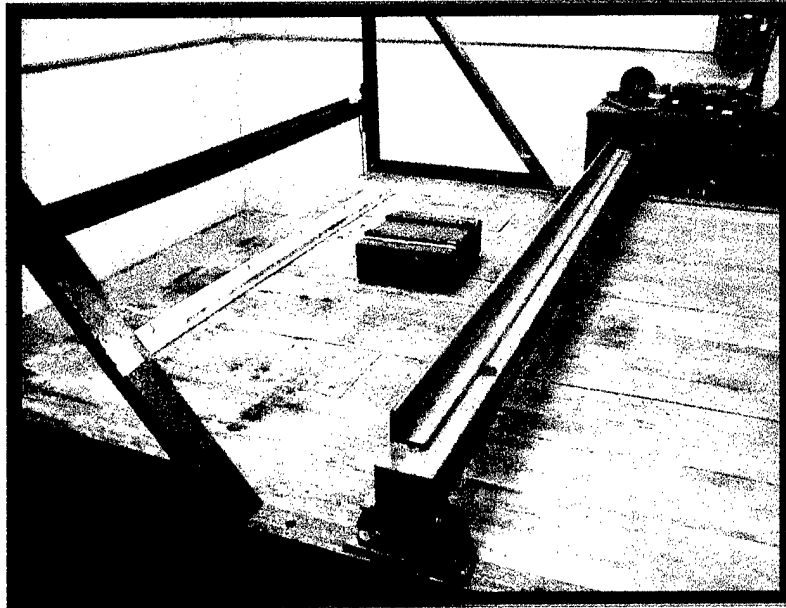


Photo 3. Vibration Test Setup for UN POP Testing

UN POP TESTS (STANDARD FORM)

**82MM HE CARTRIDGE, MODEL 30, WITH PD FUZE,
MODEL MP-1B, 3 PER BOX,
UNITED NATIONS (UN) PERFORMANCE ORIENTED
PACKAGING (POP) TEST**

U.S. Army Defense Ammunition Center
ATTN: SOSAC-DEV, 1 C Tree Road
McAlester, OK 74501-9053

918-420-8908

Jerry W. Beaver

Test Report Number: 02-07

Service Code: DEV

Product NSN: N/A

Nomenclature: Cartridge, 82m

(Part No.) 1311-5-95020

HE, W/ Fuze, PD, Model MP-1B

Shipping Name: Cartridges for Weapons

UN ID Number: 0321

Hazard Class: 1.2E

Packaging Group: II

Physical State: Solid

NALC/DODAC: N/A

CAA Number: N/A

EX Number: N/A

CFR 49 Packaging Method: 130

Net Explosive Weight: 1.854 kgs (4.08 lbs)

DESCRIPTION OF PACKAGINGS TO BE TESTED
EXTERIOR CONTAINER

Exterior Container: Natural Wood Box

CFR 49 Reference Number: 173.62

UN Code: 4C1

NSN Exterior Container: N/A

Specifications: 4C1 (Foreign)

Net Quantity Weight: 13.4 kg (29.5 lbs)

Tested Gross Weight: 16.3 kg (36 lbs)

Dimensions Interior: Height: 4" high x 10-3/4" wide x 13-1/2" long

Manufacturer: Unknown

Year Container Manufactured: Unknown

Drawing Number(s): N/A

Cushioning: None

Closure: 2 hinge/hasps with wire seals

Two 5/8" X 0.023" steel straps around the box IAW Page 3 of the SPI.

INTERMEDIATE CONTAINER

Intermediate Container Description: Plastic Containers

Specification Number: N/A

Container NSN: N/A

Intermediate Container Cushioning: N/A

Intermediate Container Closure Method: Tape

Intermediate Container Dimensions: 10-1/2" X 10-3/4" X 4"

Number Of Intermediate Containers: 2

UNIT CONTAINER

Unit Container Description: N/A

Unit Container Specification: N/A

Unit Container NSN: N/A

Unit Container Cushioning: N/A

Unit Container Closure Method: N/A

Unit Container Dimensions: N/A

Number of Unit Containers: N/A

SPECIAL NOTES

All exterior, intermediate, and unit containers must be inspected prior to use.

Inspect for physical damage, structural integrity and leakproofness of the containers. See Special Packaging Instructions (SPI) for required box modifications.

SUPPLEMENTAL INFORMATION

Permitted Transportation Modes:

Military or DOD licensed truck, rail, and ship.

Military or DOD licensed cargo aircraft.

Specific Gravity: N/A

Hydrostatic Test Pressure Applied: N/A

Leakproofness Test Pressure Applied: N/A

TEST PROCEDURES

Test Conducted	Test Method	Test Results
(1) Pre-Conditioning (fiberboard)	Part 178.602	N/A
(2) Drop Test	Part 178.603(e)(1)(ii)	Pass
(3) Leakproofness Test	Part 178.604	N/A
(4) Hydrostatic Pressure Test	Part 178.605	N/A
(5) Stacking Test (625 lbs.)	Part 178.606(c)(1)	Pass
(6) Vibration Test	Part 178.608(b)(3)	Pass

UN POP Marking

u 4C1/Y16.3/S/**

n USA/DOD/DEV

** Denotes year of manufacture

CERTIFICATION

Unless expressly stated to the contrary, we certify that all of the above applicable tests have been performed in strict conformance to CFR 49, Subpart M, Parts 178.600 – 178.608. Based on the successful test results shown above, this container is deemed suitable for transport of the hazardous material described herein, provided that maximum tested weights and quantities are not exceeded and the packaging is assembled as tested. The use of other packaging methods or components may make this test invalid.

PREPARED BY:  DATE: 2 JAN 2002

JEFFERY L. DUGAN
Test Engineer

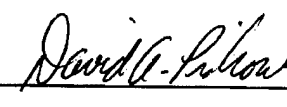
SUBMITTED BY:  DATE: 2 JAN 2002

JERRY W. BEAVER
Chief, Validation Engineering Division

APPROVED BY:  DATE: 2 JAN 2002

WILLIAM R. FRERICHS
Associate Director for Engineering

PART 5 – SPECIAL PACKAGING INSTRUCTIONS

SPECIAL PACKAGING INSTRUCTION					Form Approved OMB No. 0704-0188	
1. PART OR DRAWING NO. NOMENCLATURE 1311-5-95020 CTG., 82MM HE, TYPE 30 W/FUZE, PD DISASSEMBLED (PRC)			2. CODE IDENT 59678		3. SPINO. (AD) P 1315-FM/DEV-11	
4. NATIONAL STOCK NO. N/A			5. DATE OF SPI (YYMMDD) 020114		5. REVISION B	
7. QUP/UNIT OF ISSUE 3 EACH	8. ICQ --	9. UNIT PACK WT (lb) (0.0) 33	10. UNIT PACK CU (CU.FT) 0.700		11. UNIT PACK SIZE (INCHES) 16 X 12 X 5.52	
			18. STEPS	19. REQD	20. DESCRIPTION	
12. MILITARY PRESERVATION MIL-STD-2073-1			1	1	EXTERIOR SHIPPING CONTAINER, FM, 13.5 X 10.75 X 4	
			2	1	FWD SUPPORT PIECE, NN-P-530 W/EXT GLUE, 10 3/4 X 3 1/4 X 0.75	
13. CLEANING MIL-STD-2073-1			3	AR	FASTENERS, ASTM F 1667, 3d NAILS	
			4	2	INNER CNTR, PLASTIC, FM 10.5 X 10 3/4 X 4	
14. DRYING NA			5	AR	FILLER, FIBERBOARD, FM	
			6	1	FWD CRADLE, WOODEN, FM	
15. PACKING MIL-STD-2073-1			7	1	AFT CRADLE, LOWER, WOODEN, FM	
			8	1	AFT CRADLE, UPPER, WOODEN, FM	
a. LEVEL A MIL-STD-2073-1			9	AR	CRADLE SHIMS, TOP PADS, 10 3/4 X 8 X .008	
			10	AR	AFT FILL PIECE, 10 3/4 X 3 3/4 X 0.25	
b. LEVEL B NA			11	AR	AFT SOLID FILL, CHIPBOARD 10 3/4 X 3 3/4 X 0.125	
			12	2	CLOSURE, HINGES, HASPS & PINS-OUTER CNTR	
16. MARKING 8796522			13	1	WIRE SEAL, 8794342	
			14	2	STEEL STRAPPING, ASTM D 3953, 5/8" X 0.23 X 3.5'	
			15	2	SEAL, STRAPPING, ASTM D3953	
16. NOTES/DRAWING						
<p>A. THIS SPECIAL PACKAGING INSTRUCTION (SPI) IS PREPARED FOR USE IN THE SHIPMENT OF FOREIGN AMMUNITION IN PERFORMANCE ORIENTED PACKAGING (POP) TESTED CONTAINER (REPORT NO.02-07) IN ACCORDANCE WITH UN PACKING INSTRUCTION 130, WHEN THE MATERIAL HAS BEEN TYPE CLASSIFIED OR SUPPORTED WITH A CURRENT INTERIM HAZARD CLASSIFICATION.</p> <p>B. INSERT FORWARD SUPPORT PIECE (STEP 2) AGAINST FRONT SIDE OF FORWARD CRADLE (STEP7).</p> <p>PACK THREE (3) FUZES INTO FIRST PLASTIC CONTAINER (STEP 4) AND CLOSE. PACK THREE (3) IGNITION CARTRIDGES (WITH 9 INCREMENT CHARGES) INTO THE SECOND PLASTIC CONTAINER (STEP 4) AND CLOSE. PLACE THE TWO (2) PLASTIC CONTAINERS (STEP 4) INTO THE COMPARTMENTS IN THE EXTERIOR (STEP 1). ADD FILLER (STEP 5) AS REQUIRED TO FORM A TIGHT PACK.</p> <p>PACK THREE (3) CARTRIDGES, NOSE END FIRST, INTO THE FORWARD CRADLE (STEP 6) AND SEAT FIN END OF CARTRIDGE INTO AFT LOWER CRADLE (STEP 7). INSTALL UPPER AFT CRADLE (STEP 8) ON TOP OF CARTRIDGES, AT THE FIN END, AND SEAT IN PLACE. INSTALL AFT FILL PIECE (STEP 10) BEHIND THE FINS AND ADD SOLID FILL PIECE(S) (STEP 11) BETWEEN AFT FILL PIECE (STEP 10) AND END OF CONTAINER (STEP 1), AS REQUIRED TO FORM A TIGHT PACK. ADD CRADLE SHIMS (STEP 9) ON TOP OF CRADLES, AS REQUIRED, TO CONTACT THE LID AT TIME OF CLOSURE. CLOSE CONTAINER LID AND LATCH HASPS WITH LATCH PINS (STEP 12) AT BOTH LOCATIONS. INSTALL ONE WIRE SEAL (STEP 13) IN RIGHT LATCH AND CLOSE BY CRIMPING THE SEAL. LOCATE ONE STEEL STRAP (STEP 14) INSIDE OF EXTERIOR CONTAINER UPPER CLEAT, TO PASS UNDER AND AROUND THE CONTAINER. SEAL (STEP 15) ON TOP AT OPPOSITE ENDS OF CONTAINER. SEAL STEEL STRAPS WITH ONE DOUBLE CRIMPED SEAL.</p>						
<p>WSC: ITEM SIZE: ITEM WEIGHT: APPROVED: KW </p>						
STATEMENT A, UNLIMITED						
DD form 2169, Oct 96 Previous editions are obsolete Page 1 of 2 Pages						

1. NATIONAL STOCK NO. NA	2. DATE SUBMITTED (YYMMDD) 020115	3. REVISION B
-----------------------------	--------------------------------------	------------------

C. MARK IN ACCORDANCE WITH DRAWING 8796522 AND AS A MINIMUM:

PART NUMBER
QUANTITY
NOMENCLATURE
LOT NUMBER (IF AVAILABLE)
PACKAGE GROSS WEIGHT
SPI NO.

THE PROPER SHIPPING NAME WILL COMPLY WITH THE JOINT HAZARD CLASSIFICATION SYSTEM (JHCS) FOR TYPE CLASSIFIED ITEMS OR WITH A CURRENT INTERIM HAZARD CLASSIFICATION (CARTRIDGES FOR WEAPONS, UN 0005).

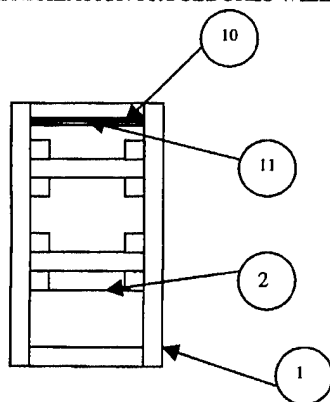
THE PERFORMANCE ORIENTED PACKAGING (POP) MARKING IS AS FOLLOWS:



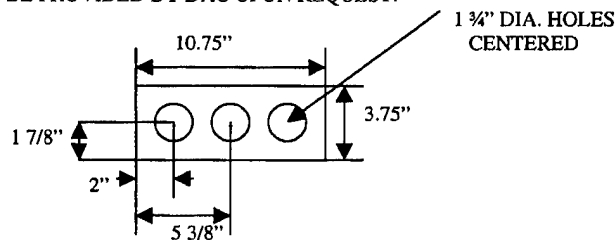
4C1/Y16/S/**
USA/DOD/DEV

**INSERT YEAR PACKED

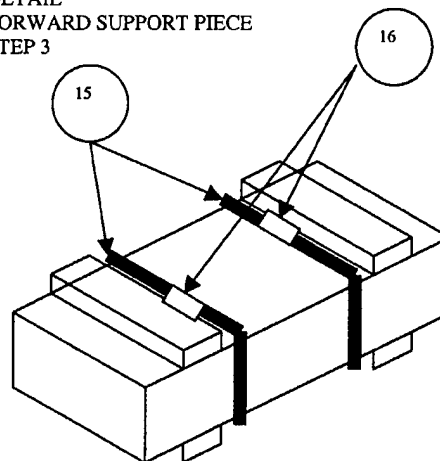
G. UNITIZATION PROCEDURES WILL BE PROVIDED BY DAC UPON REQUEST.



TOP VIEW



DETAIL
FORWARD SUPPORT PIECE
STEP 3



STRAPPING DETAIL EXTERIOR CONTAINER